ASTM C187

Standard Test Method for Amount of Water Required for Normal Consistency of Hydraulic Cement Paste

Understanding ASTM International Test Procedures for Cement and Concrete - Staying Up to Standard

Anthony F. Bentivegna, Ph.D.

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Outline

- Objectives
- Related Procedures
- Scope/Significance and Use
- Apparatus
- Temperature and Humidity Requirements
- Procedure Molding Specimen
- Procedure Determining Normal Consistency
- Calculation Water Content
- Understand Limitations of Procedure

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Objectives

- Define Key Terminology
- Identify Necessary Equipment
- Understand Sources of Errors
- Understand Limitations of Procedure

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Related Procedures

- ASTM C219 – Terminology Relating to Hydraulic Cement
- ASTM C305 – Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
- ASTM C511 – Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

Related Procedures

- ASTM C1005 – Specification for Reference Masses and Devices for Determining Mass and Volume for Use in the Physical Testing of Hydraulic Cements
- ASTM D1193 – Specification for Reagent Water
- ASTM E177 – Practice for Use of the Terms Precision and Bias in ASTM Test Methods

Scope/Significance and Use

- ***Scope:*** This test method covers the determination of the normal consistency of hydraulic cement
- ***Significance and Use:*** This test method is intended to be used to determine the amount of water required to prepare hydraulic cement pastes with normal consistency, as required for certain standard tests.

Key Terminology

- Normal Consistency - a degree of plasticity of a hydraulic cement paste that is appropriate for testing as measured by a stipulated method.
- Discussion —The result of tests for normal consistency is reported as the mass of water required to achieve this plasticity divided by the mass of hydraulic cement, expressed as a percentage.

Source: ASTM C219

Apparatus

- Reference Masses
- Devices for Determining Mass
- Glass Graduates
- Vicat Apparatus
- Flat Trowel

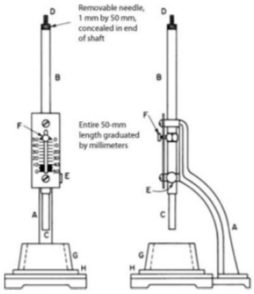
Apparatus: Reference Masses and Devices for Determining Mass

- Conforming to the requirements of Specification C1005.
- Devices for determining mass shall be evaluated for precision and bias at a total load of 1000 g.

Apparatus: Glass Graduates

- 200 or 250-mL capacity, and conforming to the requirements of Specification C1005.

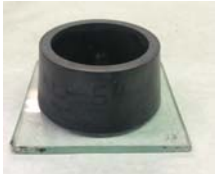
Apparatus: Vicat Apparatus

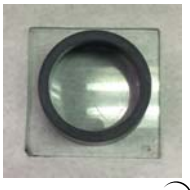


Source: ASTM C187

Apparatus: Ring

- Inside diameter of ring at bottom 70 ± 3 mm
- Inside diameter of ring at top 60 ± 3 mm
- Height of ring 40 ± 1 mm





Apparatus: Flat Trowel

- Having a sharpened straight-edged steel blade 100 to 150 mm in length.

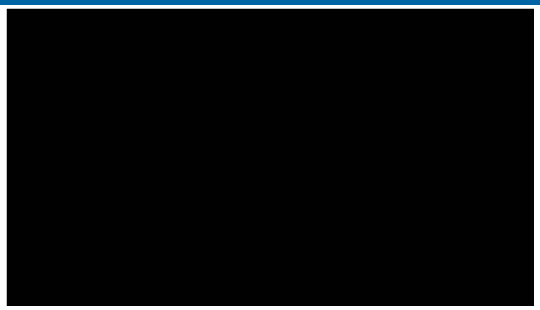
Temperature and Humidity Requirements

- The temperature of the air and mixing water shall conform to the requirements of Specification C511.
  - Air – Temp. 23.0 ± 4.0°C
  - Mixing Water - shall be 23.0 ± 2.0 °C
- The relative humidity of the laboratory shall conform to the requirements of Specification C511.
  - Relative Humidity - not less than 50 %

Procedure: Mixing

- Mix 650 g of cement with a measured quantity of water following the procedure prescribed in the Procedure for Mixing Pastes and Practice C305.
- The water shall conform to the numerical limits of Specification D1193 for Type III or Type IV grade of reagent water.

Procedure: Molding Test Specimens



Procedure: Molding Test Specimens (1/2)

1. Mix per ASTM C305

2. Toss 6 Times

3. Press Ball in Larger End of Conical Ring

Procedure: Molding Test Specimens (2/2)

4. Place Conical Ring on Base Plate

5. Slice Off Excessive Paste

Procedure: Consistency Determination

Procedure: Consistency Determination

1. Center Ring and Base Plate under Rod

2. Place Plunger in Contact with Paste and Zero Reading

3. Release the Plunger

Calculation

- Calculate the amount of water required for normal consistency as the mass of water divided by the mass of dry cement, expressed as a percentage.
- Calculate the mass ratio to the nearest 0.1% and report the mass ratio to the nearest 0.5%.

$$P = \frac{Quantity\ Water\ (g)}{Quantity\ Cement\ (g)} X\ 100$$

P = Percentage of Water(%)

Limitations and Errors

- Gauging time should be strictly observed.
- Room temperature should be well maintained as per test requirement.
- All apparatus used should be clean.
- The experiment should be performed away from vibrations and other disturbances.
- Do not compress paste in conical ring.
- Mixtures containing SCMs (especially Silica Fume) normal consistency are very sensitive to water.

Questions & Answers